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Appl. No.: **10/780,539** Examiner: **Roberta A Shand**

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Title: EFFICIENT AUTOMATIC REPEAT REQUEST METHODS AND APPARATUS

Mail Stop Amendment
Commissioner for Patents
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**Interview Discussion Outline/Agenda**

Sir:

This submission is being made to allow the Examiner to prepare for the June 25, 2009 in-person interview which has been scheduled.

**LISTING OF CLAIMS TO FACILITATE DISCUSSION:**

***** NOT TO BE ENTERED AS AN AMENDMENT*****

This listing of claims is provided to facilitate the discussion **and is NOT intended to be entered as an amendment.**

Claim 1 (previously presented): A communications method, the method comprising:

operating a first communications device to:

perform a decoding operation on a first signal including encoded signal information;

determine if the encoded signal information included in the first signal was successfully decoded;

when it is determined that said encoded information was successfully decoded, generating an ACK signal having an ACK signal value; and

when it is determined that said encoded information was not successfully decoded, generating a first NAK signal having one of a plurality of possible NAK signal values, each NAK signal value, in the plurality of NAK signal values, differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value, each of said plurality of possible NAK signal values corresponding to a different level of decoding success.

Claim 2 (original): The method of claim 1, wherein said decoding operation produces decoded information, the step of generating a first NAK signal including:

selecting the first NAK signal value as a function of the quality of the decoded information.

Claim 3 (previously presented): The method of claim 2, wherein said NAK signal values are coded using phase, each one of the NAK signal values differing from one

another in phase, the ACK signal value being communicated by a phase which is different from the phase of any one of the plurality of NAK signal values.

Claim 4 (previously presented): The method of claim 1, wherein said NAK and ACK signals are complex signals and wherein said NAK signal values and said ACK signal values are phase values.

Claim 5 (original): The method of claim 1,

wherein operating the first device to perform a decoding operation includes:

determining the quality of decoded information generated by decoding said encoded information;

wherein operating the first device to generate a first NAK signal includes operating the first device to select the first NAK signal value as a function of the determined quality of the decoded information; and

wherein operating the first device further includes operating the first device to transmit the generated first NAK signal.

Claim 6 (original): The method of claim 5, wherein determining the quality of the decoded information includes:

maintaining decoding statistics indicating the reliability of the decoded information, said decoding statistics indicating the quality of the decoded information.

Claim 7 (original): The method of claim 6, wherein the maintained decoding statistics include a count of the number of detected errors in the decoded information.

Claim 8 (previously presented): The method of claim 5, further comprising:

operating a second device to:

i) receive said first NAK signal; and

ii) determine, from said first NAK signal value, an amount of redundant information to transmit to said first device from, different amounts of redundant information being determined for at least two different NAK signal values.

Claim 9 (previously presented): The method of claim 5, further comprising:

operating the first device to:

receive in a second signal including redundant information corresponding to said first received encoded signal;

perform an additional decoding operation using said redundant information and information obtained from said first received signal; and

determine if the additional decoding operation successfully decoded the encoded signal information included in the first signal.

Claim 10 (original): The method of claim 9, wherein said step of operating the first device to perform an additional decoding operation includes:

receiving a traffic channel assignment message from a second device; and

identifying from information included in said traffic channel assignment message, the first signal to which said second signal corresponds.

Claim 11 (original): The method of claim 10,

wherein said first device is a mobile node and said second device is a base station; and

wherein the information included in said traffic channel assignment message used to identify the first signal is an index of a traffic segment used to transmit the first signal.

Claim 12 (previously presented): A communications method, the method comprising:

performing a decoding operation on a first signal including encoded signal information, said decoding operation including determining the quality of decoded information generated by decoding said encoded information;

determining if the encoded signal information included in the first signal was successfully decoded;

when it is determined that said encoded information was not successfully decoded, generating a first NAK signal having one of a plurality of possible NAK signal values, each of said plurality of possible NAK signal values corresponding to a different level of decoding success, generating a first NAK signal including selecting the first NAK signal value as a function of the determined quality of the decoded information;

transmitting the generated first NAK signal; receiving a traffic channel assignment message;

identifying from information included in said traffic channel assignment message, the first signal to which a second signal corresponding to the traffic assignment message corresponds;

receiving in the second signal redundant information corresponding to said first received encoded signal;

performing an additional decoding operation using said redundant information and information obtained from said first received signal;

determining if the additional decoding operation successfully decoded the encoded signal information included in the first signal; and

wherein the information included in said traffic channel assignment message used to identify the first signal is a traffic channel index difference indicating a difference between the index of a traffic channel segment associated with the assignment message and a traffic channel segment used to transmit the first signal.

Claim 13 (original): The method of claim 9, wherein said first device is a base station and said second device is a mobile node, the method further comprising:

operating the first device to transmit an uplink channel assignment message to the second device;

operating the second device to identify from information included in the uplink channel assignment message the first signal for which redundant information is to be transmitted in an uplink channel segment assigned by said channel assignment message; and

operating the second device to transmit said second signal including redundant information.

Claim 14 (original): The method of claim 13,

wherein the information included in said uplink channel assignment message used to identify the first signal is an index of a uplink traffic segment used to transmit the first signal.

Claim 15 (original): The method of claim 13,

wherein the information included in said traffic channel assignment message used to identify the first signal is an uplink traffic channel index difference indicating a difference between an index of an uplink traffic channel segment associated with the

assignment message and an uplink traffic channel segment used to transmit the first signal.

Claim 16 (original): The method of claim 9, wherein said second signal includes, in addition to said redundant information, new encoded information, the method further comprising:

operating said first device to decode said new encoded information.

Claim 17 (original): The method of claim 9, further comprising:

operating the first device to determine if the encoded signal information included in the first signal was successfully decoded by said additional decoding operation; and

when it is determined that said encoded information was not properly decoded by said additional decoding operation, operating the first device to generate a second NAK signal having one of said plurality of possible NAK signal values, each of said plurality of possible NAK signal values corresponding to a different level of decoding success, operating the first device to generate a second NAK signal including selecting a second NAK signal value as a function of the quality of decoded information generated by said additional decoding operation.

Claims 18-25 (canceled):

Claim 26 (previously presented): A communications device comprising:

means for performing a decoding operation on a first signal including encoded signal information;

means for determining if the encoded signal information included in the first signal was successfully decoded; and

means for generating a first NAK signal having one of a plurality of possible NAK signal values, when it is determined that said encoded information was not successfully decoded, each of said plurality of possible NAK signal values corresponding to a different level of decoding signal success, each NAK signal value, in the plurality of NAK signal values, differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from an ACK signal value.

Claim 27 (original): The device of claim 26,

wherein said means for performing a decoding operation produces decoded information; and

wherein said means for generating a first NAK signal selects the first NAK signal value as a function of the quality of the decoded information.

Claim 28 (original): The communications device of claim 27, further comprising:

a transmitter, coupled to said means for generating a first NAK signal, for transmitting the generated first NAK signal;

a receiver for receiving a second signal including redundant information corresponding to said first received encoded signal; and

wherein said means for perform a decoding operation includes means for performing an additional decoding operation using said redundant information and information obtained from said first received signal.

Claim 29 (original): The communications device of claim 28, further comprising:

means for determining if the additional decoding operation successfully decoded the encoded signal information included in the first signal; and

means for generating a second NAK signal by selecting a second NAK signal value as a function of the quality of decoded information generated by said additional decoding operation, when it is determined that said encoded information was not properly decoded by said additional decoding operation, said second NAK signal having one of said plurality of possible NAK signal values.

Claim 30 (previously presented): A method of operating a communications device comprising:

encoding, using an encoder, information to be transmitted to produce a first set of encoded information and a set of redundant information;

transmitting said first set of encoded information in a first signal;

receiving a NAK signal from a device to which said first signal was transmitted; and

selecting a portion of the set of redundant information to transmit to said first device as a function of the value of the received NAK signal, said received NACK

signal being one of a plurality of possible NACK signal values differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from an ACK signal value, said function causing different amounts of redundant information to be selected for at least two different possible NAK signal values.

Claim 31 (original): The method of claim 30, further comprising:

including in a first assignment signal used to assign a communications channel segment used to transmit said first signal, an indicator indicating that the first signal does not correspond to a previously transmitted signal; and

transmitting said first assignment signal prior to or in parallel with transmitting said first signal.

Claim 32 (original): The method of claim 30, wherein selecting a portion of the set of redundant information to be transmit includes selecting a larger size portion of redundant information when the value of the NAK signal indicates a first level of received encoded signal quality than when the value of the NAK signal indicates a second level of received encoded signal quality that is better than said first level of received encoded signal quality.

Claim 33 (previously presented): The method of claim 32, further comprising:

transmitting a second assignment signal indicating an assignment of a channel segment to be used to transmit said selected portion of the set of redundant information, said second assignment signal including information identifying a channel segment used to transmit said first signal; and

transmitting the selected portion of the set of redundant information to said first device in a second information signal.

Claim 34 (original): The method of claim 33, further comprising:

performing a second encoding operation on additional information to be transmitted to produce a second set of encoded information and a second set of redundant information; and

wherein transmitting a second information signal includes:

including in said second information signal a portion of said second set of encoded information.

Claim 35 (original): The method of claim 30, wherein said encoding operation is a low density parity check coding operation.

Claim 36 (previously presented): A communications device comprising:

an encoder configured to encode information to be transmitted to produce a first set of encoded information and a set of redundant information;

a transmitter configured to transmit said first set of encoded information in a first signal;

a receiver configured to receive signals communicating acknowledgments, said acknowledgments being either a positive acknowledgement (ACK) signal value or one of a plurality of possible negative acknowledgment (NAK) signal values, from a first device to which said first signal was transmitted, each NAK signal value, in the plurality of possible NAK signal values, differing from any other one of the possible NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value;

a processing module configured to process received signals to recover there from communicated acknowledgement information; and

a retransmission control module configured to select a portion of the set of redundant information to transmit to said first device as a function of the recovered acknowledgement information, said function causing different amounts of redundant information to be selected for at least two different possible NAK signal values.

Claim 37 (original): The device of claim 36, further comprising:

means for generating an assignment signal used to assign a communications channel segment used to transmit said first signal said assignment signal including an indicator indicating that the first signal does not correspond to a previously transmitted signal; and

means for controlling the transmitting said first assignment signal prior to transmitting said first signal.

Claim 38 (previously presented): The device of claim 36, wherein said means for selecting selects a portion of the set of redundant information to be transmitted selects a first size portion when the value of the NAK signal indicates a first level of received encoded signal quality, said first size portion being a larger size portion of redundant information than a second size portion which is selected by said means for selecting when the value of the NAK signal indicates a second level of received encoded signal quality that is better than said first level of received encoded signal quality.

Claim 39 (previously presented): A communications device comprising:

a decoder module configured to decode a first signal including encoded signal information;

a determination module configured to determine if the encoded signal information included in the first signal was successfully decoded;

a signal generation module configured to generate acknowledgement signals, said acknowledgement signals including an ACK signal having an ACK signal value, when it is determined that said encoded information was successfully decoded and a first NAK signal having one of a plurality of possible NAK signal values when it is determined that said encoded information was not successfully decoded, each NAK signal value, in the plurality of NAK signal values, differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value, each of said plurality of possible NAK signal values corresponding to a different level of decoding success.

Claim 40 (previously presented): The device of claim 39, further comprising:

a quality determination module configured to generate and maintain decoding information indicating the quality of a decoded signal.

Claim 41 (previously presented): The device of claim 39, further comprising:

a storage device including NAK level information, said NAK level information including discrete level information, said discrete level information including a plurality of NAK signal values, each possible NAK signal values corresponding to a different level of signal quality and a different phase.

Claim 42 (previously presented): A machine readable medium including machine executable instructions, for use in a communications device, said machine readable medium comprising:

instructions for causing said device to perform a decoding operation on a first signal including encoded signal information;

instructions for causing said device to determine if the encoded signal information included in the first signal was successfully decoded;

instructions for causing said device to generate an ACK signal having an ACK signal value, when it is determined that said encoded information was successfully decoded; and

instructions for causing said device to generate a first NAK signal having one of a plurality of possible NAK signal values when it is determined that said encoded information was not successfully decoded, each NAK signal value, in the plurality of NAK signal values, differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value, each of said plurality of possible NAK signal values corresponding to a different level of decoding success.

Claim 43 (previously presented): A communications device comprising:

encoding means for encoding information to be transmitted to produce a first set of encoded information and a set of redundant information;

transmitter means for transmitting said first set of encoded information in a first signal;

receiver means for receiving signals communicating acknowledgments, said acknowledgments being either a positive acknowledgement (ACK) signal value or one of a plurality of possible negative acknowledgment (NAK) signal values, from a first device to which said first signal was transmitted, each NAK signal value, in the plurality of possible NAK signal values, differing from any other one of the possible NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value;

processing means for processing received signals to recover there from communicated acknowledgement information; and

retransmission control means for selecting a portion of the set of redundant information to transmit to said first device as a function of the recovered

acknowledgement information, said function causing different amounts of redundant information to be selected for at least two different possible NAK signal values.

Claim 44 (previously presented): A machine readable medium including machine executable instructions, for use in a communications device, said machine readable medium comprising:

instructions for causing said device to encode information to be transmitted to produce a first set of encoded information and a set of redundant information;

instructions for causing said device to transmit said first set of encoded information in a first signal;

instructions for causing said device to receive signals communicating acknowledgments, said acknowledgments being either a positive acknowledgement (ACK) signal value or one of a plurality of possible negative acknowledgment (NAK) signal values, from a first device to which said first signal was transmitted, each NAK signal value, in the plurality of possible NAK signal values, differing from any other one of the possible NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value; and

instructions for causing said device to process the received signals to recover there from communicated acknowledgement information;

instructions for causing said device to select a portion of the set of redundant information to transmit to said first device as a function of the recovered acknowledgement information, said function causing different amounts of redundant information to be selected for at least two different possible NAK signal values.

## REMARKS/ARGUMENTS

This submission is being made to allow the Examiner to prepare for the June 25, 2009 in-person interview which has been scheduled.

### I. Introduction

Claims 1, 2, 5-17 and 26-44 are pending in the application. Claim 12 is allowed. Claims 1, 2 5-11, 13-17 and 26-44 are rejected.

As will be discussed below, none of the pending claims are anticipated or rendered obvious by the applied references.

In the office action there is some confusion as to what the basis of the rejection is. The text refers to Hwang while the Examiner appears to intend to refer (see paragraph 2 of the office action) to the Black publication U.S. 20004/0100927 in combination with the Chang patent (U.S. 6,895,010).

Applicant respectfully submits that claim 1 is patentable because it recites, among other things, the features indicated in bold below:

> A communications method, the method comprising:
> operating a first communications device to:
> perform a decoding operation on a first signal including encoded signal information;
> determine if the encoded signal information included in the first signal was successfully decoded;
> when it is determined that said encoded information was successfully decoded, generating an ACK signal having an ACK signal value; and
> when it is determined that said encoded information was not successfully decoded, **generating a first NAK signal having one of a plurality of possible NAK signal values, *each NAK signal value, in the plurality of NAK signal values, differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value*, each of said plurality of possible NAK signal values corresponding to a different level of decoding success.**

In addition, dependent claim 4 is patentable for the additional reason that it recites:

> The method of claim 1, **wherein said NAK and ACK signals are complex signals and wherein said NAK signal values and said ACK signal values are phase values.**

Applicant's representative intends to discuss the Examiner's application of the references to the claims. In the office action the Examiner states:

> 4. **Hwang does not explicitly teach the first NAK signal corresponding to one of a plurality of possible NAK signal values,** each NAK signal value, in the plurality ofNAK signal values, having a NAK signal phase differing from any other one of the plurality of possible NAK signal values, the NAK signal phase between any two of the plurality of possible NAK values having a first quantitative difference less than a second quantitative difference between the NAK signal phase of less than the smallest amount anyone of said plurality of possible NAK signal values and the ACK signal phase.
>
> 5. Chang teaches (fig. 4) the first NAK signal corresponding to one of a plurality of possible NAK signal values (col. 17, line 61 - col. 18, line 6, **Chang teaches each NAK has a value corresponding to the sequence number of the frame received in error**), each NAK signal value, in the plurality of NAK signal values, having a NAK signal phase differing from any other one of the plurality of possible NAK signal values (Each sequence number representing the frame received in error is assigned to the NAK value is unique and unlike the other sequence numbers as each frame is different), the NAK signal phase between any two of the plurality of possible NAK values having a first quantitative difference less than a second quantitative difference between the NAK signal phase of less than the smallest amount anyone of said plurality of possible NAK signal values and the ACK signal phase (col. 19, lines 14-67, **Chang teaches a NAK time counter and each NAK value is reflected from that time. Therefore any phase (time difference) between any two NAKs will differ from a phase (time difference) between any other NAKs). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hwang to include Chang's NAK values to ensure that the proper data is retransmitted.**

Applicants respectfully submit that signal **phase** and transmission time are NOT the same thing. More importantly however, the Examiner has not indicated what the value of an ACK signal in the reference might be and where the reference shows

> ***…each NAK signal value, in the plurality of NAK signal values, differing from any other one of the NAK signal values in said plurality by an amount which is less than the smallest amount any one of said NAK signal values differs from said ACK signal value.***

It is requested that the Examiner be prepared to clarify what ACK signal value or values are possible in the Chang reference and how they differ from NAK signal values.

Applicant's representative looks forward to discussing the Application with the Examiner during the in-person interview.

None of the statements or discussion made herein are intended to be an admission that any of the applied references are prior art to the present application and Applicants preserve the right to establish that one or more of the applied references are not prior art.

Respectfully submitted,

**June 24, 2009**

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